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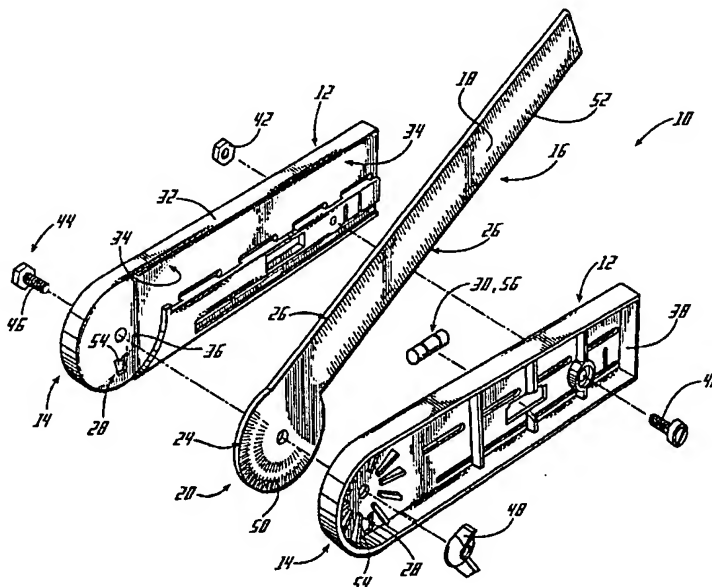
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(54) Title: **MULTI-FUNCTION LEVEL**



(57) Abstract: A multi-function level comprising a base member (12) having a curved end (14) and a movable protractor arm (16) having a blade (18) and a circular end (20). An assembly is for pivot locking the circular end of the movable protractor arm to the curved end of the base member. A facility on the circular end of the movable protractor arm indicates angular movement. A component on the blade of the movable protractor arm indicates length measurement. A structure (28) in the curved end of the base member is for viewing the angular measurement facility on the circular end of the movable protractor arm. An element (30) in the base member is for leveling the base member.

## MULTI-FUNCTION LEVEL

### BACKGROUND OF THE INVENTION

#### I. Field of the Invention.

5       The present invention relates generally to angle measuring devices. More particularly, the invention comprises a multi-function level.

In general, a first field of use of the disclosed invention is by carpenters as the most likely benefactors of the unique advantages of the instant invention. However, many other fields, such as for use by roofers, masons, steam fitters and the like, could find potentially  
10   beneficial uses of this invention.

Thus, it can be seen that the potential fields of use for this invention are myriad and the particular preferred embodiments described herein is in no way meant to limit the use of the invention to the particular field chosen for exposition of the details of the invention.

A comprehensive listing of all the possible fields to which this invention may be  
15   applied is limited only by the imagination and is, therefore, not provided herein. Some of the more obvious applications are mentioned in the interest of providing a full and complete disclosure of the unique properties of this previously unknown general purpose article of manufacture. It is to be understood from the outset that the scope of this invention is not limited to these fields or to the specific examples of potential uses presented herein.

#### 20       II. Description of the Related Art.

Various devices are well known in the prior art which deal with measuring of angles for various purposes, and many of the angle measuring devices utilize a bubble level to effect leveling of the device during the measurement process. Many of the devices shown in the prior art have indicia upon a movable arm for reading the angle measured. However, no one patent fully shows each and every aspect of the invention.

Angle measuring devices are shown in the United States Patents No. D-259,545,  
issued to Ulric M. Rocheleau on June 16, 1981; No. 1,341,435, issued to Karl O. Olsen on  
May 25, 1920; No. 3,270,420, issued to Wayne A. Simril on March 13, 1964; No. 3,343,265  
issued to Miguel A. Puerta on June 3, 1965; No. 4,144,650, issued to Eugene Rawlings et al.  
5 on March 20, 1979; No. 4,394,801, issued to Francis Thibodeaux on July 26, 1983; No.  
4,442,606, issued to Douglas A. Graham et al. on April 17, 1984; No. 4,481,720, issued to  
Francis P. Sury on November 13, 1984; No. 4,562,649, issued to Frank Ciavarella on January  
7, 1986; No. 4,744,152, issued to Daniel Roach et al. on May 17, 1988; No. 4,745,689, issued  
to Paul J. Hiltz on May 24, 1988; No. 4,922,621, issued to Charles J. Maier on May 8, 1990;  
0 No. 5,189,804, issued to Edward Ostachowski on March 2, 1993; and No. 5,586,395, issued  
to Jerry P. Malczewski on December 24, 1996.

U.S. Patent Number D-259,545 to Rocheleau discloses a multi-rule. The ornamental  
design for the multi-rule, is shown and described. Figure 1 is a top plan view of the multi-  
rule showing the new design. Figure 2 is a side elevational view thereof with the blade in the  
5 folded position, the rear being substantially a mirror image thereto. Figure 3 is a bottom plan  
view thereof with the blade in the folded position. Figure 4 is a right side elevational view  
thereof with the blade in the folded position. Figure 5 is a left side elevational view thereof  
with the blade in the folded position.

U.S. Patent No. 1,341,435 to Olsen discloses a bevel square for shipbuilding. The  
0 bevel square will obviate much labor on the part of workmen engaged in shipbuilding. The  
square has the required markings for use in shipbuilding and has means for readily reading  
these markings.

U.S. Patent No. 3,270,420 to Simril discloses a goniometer. The present invention is  
an instrument for measuring the degree of angulation of the spine directly from an X-ray film.  
5 The instrument includes a pair of pivoted arms having a protractor surrounding the pivot

point and sliding bars mounted on the arms and adapted to be positioned on the film in a manner such that the degree of angulation can be rapidly and accurately read from the included protractor without marking the film or taking the time to draw lines and measure angles.

5 U.S. Patent No. 3,343,265 to Puerta discloses a drafting instrument. The drafting instrument can be utilized for multiple purposes, and comprises a rectilinear main body portion having scales embossed thereon adjacent its edges and a pivotal body portion attached at its end to one end of the body portion. The pivotal body portion has scales embossed thereon adjacent its edges, and defines a rectilinear slot extending centrally of its length. The  
10 pivotal body portion is connected to the main body portion by a pivot pin, and the pivot pin is movable through the slot of the pivotal body portion.

U.S. Patent No. 4,144,650 to Rawlings et al. discloses a multi-functional level. A pair of arms are pivotally connected for relative rotation and a brake actuated by a rotatable lever positionable from either side of the level restrains the arms against relative rotation or to  
15 allow the arms to freely rotate.

U.S. Patent No. 4,394,801 to Thibodeaux discloses a multifunction, multipurpose construction tool. The multifunction, multipurpose construction tool is comprised generally of two operating arms pivotally connected via their terminal ends, preferably their rounded terminal ends, one to the other. An angle indicator is provided at the pivotal connection, or  
20 hub, for reading the angle formed by the two arms. A pair of alternately disposed abutments are located at the extremities defining the rounded end of one of the arms as well as the beginning and end of the scale of angular component values of the scale. A stop located on the rounded terminal end of the other pivotally connected arm provides a means for indexing the scale of angular values between the alternately disposed abutments. In its preferred form,  
25 the operating arm carrying the indicia representative of the angular scale of values is

constituted of a pair of alternately disposed generally similar spaced apart panels. The indicia marks are located on an outer surface of the rounded end of the pivotally connected terminal end of the member. The opposite arm is constituted of a single panel which can be retracted within the spaced apart alternately disposed panels.

5 U.S. Patent No. 4,442,606 to Graham et al. discloses a digital goniometer. It is an electro-mechanical device for measuring the angle made by two rotatably joined members comprising a pair of rotatably connected elongated arms and electrical circuit means mounted on one of the arms and associated with the rotatable pin connector of the arms. The circuit, powered by a battery, encodes the angle of the pin preferably via a potentiometer and  
10 transmits the information to a decoding device, preferably a voltmeter, and then to a digital display device also mounted on one of the arms.

U.S. Patent No. 4,481,720 to Sury discloses a combined level and protractor with calibration features. An elongated body is provided including opposite side portions removably secured together by transverse threaded fasteners. One set of corresponding ends  
15 of the side portions include relieved areas opening toward each other defining a cavity opening outwardly of the corresponding end of the body and along one longitudinal edge thereof. A protractor arm is pivotally mounted within the notch for movement between a retracted position received within the cavity and extending along the one edge and an extended position disposed at substantially ninety degrees relative to the elongated body. The  
20 body and protractor arm include coacting structure for adjustably limiting angular displacement of the protractor arm to the extended position and the ends of the opposite side portions of the body remote from the protractor arm include two pairs of opposing sockets formed therein in which spirit level supporting annular bodies are mounted. The bodies are angularly adjustable in the corresponding sockets and clamped in adjusted angularly  
25 displaced positions between the body opposite side portions. The body side portions

including windows registered with the spirit levels and a first form of the invention incorporates worm wheel teeth on the annular bodies and worm gear shafts journaled between the body side portions and meshed with the worm wheels. In a second form of the invention, the body side portions are notched and the annular bodies include a peripheral recess  
5 registered with the notches with which a lever tool may be engaged through the notches.

U.S. Patent No. 4,562,649 to Civarella discloses an adjustable carpenter square. The adjustable carpenter square for use in determining the relative angles between two predetermined points is defined by a pair of longitudinal extensions pivotally attached together at one end.

10 U.S. Patent No. 4,744,152 to Roach et al. discloses a tool for measuring angles on various articles. A protractor quadrant tool accessory is provided and consists of two arms attached pivotally together at one end, degree calibrations so that the angle between the arms is readily read and a locking device whereby the angle between the arms can be maintained fixed so that the protractor quadrant tool accessory can be used by a machinist and carpenter  
15 to measure angles on various articles. In a modification stud guides attached to outer parallel straight edges of the arms can stabilize the tool accessory when measuring the stairways stud angles and the like, used as an isometric center finder and making equal and opposite converse lines upon a stud. In still another modification an adjustable trimitre is slidably locked upon one arm so as to stabilize the tool accessory when measuring the stud angles and  
20 the like to be cut.

U.S. Patent No. 4,745,689 to Hiltz discloses a multi-functional measuring and layout tool. The multi-functional tool has elements adapted to function as a level, bevel, protractor, square, and scale. Indicia are inscribed on mutually rotatable components of the tool for determining a mitre. The tool may include a magnet on the base to hold it in position on a  
25 metal surface.

U.S. Patent No. 4,922,621 to Maier discloses an angle guide apparatus. It is an improved guide apparatus for replicating angles of the type having a main member with a straight edge, a bubble-level device on the main member, and an angle arm pivotably attached to the main member. A slot in an end of the main member receives the angle arm, and a bolt  
5 which extends through the main member and the angle arm to form a pivot point has a hand-tightening nut or the like on it for quick angle replication in direct and reverse angle situations without additional tools. In some preferred embodiments the slot extends through the entire main member and/or the opposite surfaces thereof are tapered at the pivot connection to facilitate tightening even though the main member is of substantially rigid construction.

10 U.S. Patent No. 5,189,804 to Ostachowski discloses an angle indicating instrument. The angle indicating instrument is for indicating an angle to be used in the cutting and subsequent joining of pieces of material. A first arm and a second arm of the angle indicating instrument are positioned so as to engage the angle indicating instrument in an engaged angle, which is the angle between the two pieces of material to be joined. The indicated angle is a  
15 calculated angle and is calculated based on the engaged angle.

U.S. Patent No. 5,586,395 to Malczewski discloses a level angle gauge. The level angle gauge is used to capture an angular measurement on a structure. The level angle gauge includes an elongated body structure, an arm structure pivotally connected to the body and an arm lock mechanism that locks and unlocks to allow and inhibit pivotal movement of the arm  
20 structure. The body structure has opposite sides and a reference surface extending therebetween. The arm has an arm surface that is in a common plane with the reference surface in a first position. The arm lock mechanism being dimensioned to be less than the width of the reference surface. The body structure is formed as a web having opposite flange, one of which is foreshortened. The arm structure includes a pair of parallel arm members  
25 such that the web of the body structure interposed therebetween. A connector piece joins the

arm members, and a notch is provided in the web to receive the connector piece when the arm structure is in the first position.

The present invention is completely different than these patents in that it consists of a multi-function level for measuring and scribing angles on a work piece. The invention has a  
5 movable protractor arm with respect to the base member, which may be positioned to either read or show a particular angle and to be able to scribe an angle with respect to the base. In addition, there is a bubble vial fixed in the base member for purposes of leveling the invention should it be necessary to have a level base member prior to scribing. It also includes a view window in the base member in which angle readings are read, indicia on the  
10 movable protractor arm for length measurement and a thumb locking nut to adjustably fix the movable protractor arm.

None of the above inventions and patents, taken either singly or in combination, is seen to describe the instant invention as claimed.

15

#### SUMMARY OF THE INVENTION

The present invention is a multi-function level that consists of a base member with a movable protractor arm. The base member has a bubble vial while the protractor arm has length measurement indicia thereon. A view window is in the base member for angle readings and a thumb locking nut will adjustably fix the movable protractor arm.

20

Accordingly, the invention provides a multi-function level that will overcome the shortcomings of the prior art devices. Further, the invention provides a multi-function level that includes in combination a base member, a movable protractor arm, a bubble vial in the base member, length measurement indicia on the protractor arm, an angle reading view window in the base member and a thumb locking nut to adjustably fix the protractor arm.

25

The multi-function level of the invention is simple and easy to use and is economical



to manufacture.

Other objects, advantages and capabilities of the invention will become apparent from the following description taken in conjunction with the accompanying drawings showing the preferred embodiment of the invention.

5

### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an exploded front perspective view of the invention with the movable protractor arm in an open position;

Figure 2 is an assembled end elevational view taken in the direction of arrow 2 in  
10 Figure 1;

Figure 3 is an assembled front elevational view taken in the direction of arrow 3 in  
Figure 2;

Figure 4 is an assembled front perspective view of the invention; and

Figure 5 is an assembled rear perspective view taken in the direction of arrow 5 in  
15 Figure 4 with the movable protractor arm in a closed position.

For a fuller understanding of the nature and desired objects of this invention, reference should be made to the following detailed description taken in connection with the accompanying drawings.

20

### DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings wherein like reference numerals designate corresponding parts throughout the several figures, reference is made to Figures 1 through 5 which illustrate the various components of the present invention being a multi-function level 10 comprising a base member 12 having a curved end 14 and a movable protractor arm 16 having a blade 18  
25 and a circular end 20. An assembly 22 pivot locks circular end 20 of movable protractor arm

16 to curved end 14 of base member 12. A facility 24 on circular end 20 of movable protractor arm 16 indicates angular measurement. A component 26 on blade 18 of movable protractor arm 16 indicates length measurement. A structure 28 in curved end 14 of base member 12 is for viewing the angular measurement facility 24 on circular end 20 of movable  
5 protractor arm 16. An element 30 in base member 12 is for leveling base member 12.

Base member 12 includes a first elongate body 32 having a longitudinal recess 34 with an arced end portion 36 on one side, matching in size to blade 18 and circular end 20 of movable protractor arm 16. A second elongate body 38 is provided. A retainer bolt 40 and nut 42 hold first elongate body 32 to second elongated body 38, remote from circular end 20  
10 of movable protractor arm, 16 being in an arced portion 36 of longitudinal recess 34.

Pivot locking assembly 22 consists of a pivot bolt 44 having a threaded shaft 46 extending centrally through curved end 14 of base member 12 and circular end 20 of movable protractor arm 16. A wing nut 48 is threaded onto threaded shaft 46 of pivot bolt 44, so that when wing nut 48 is tightened, circular end 20 of movable protractor arm 16 will be retained  
15 in a stationary manner. Angular measurement indicating facility 24 includes angle degree indicia 50 on circular end 20 of movable protractor arm 16.

Length measurement indicating component 26 includes length measurement indicia 52 on blade 18 of movable protractor arm 16. Angular measurement viewing structure 28 contains at least one view window 54 in curved end 14 of base member 12. Leveling element  
20 30 is a bubble vial 56 longitudinally mounted within base member 12.

The multi-function level 10 has a plurality of uses, depending upon the desires of a person. For instance, to create a particular angle between zero to ninety degrees, the wing nut 48 may be loosened and the movable protractor arm 16 pivoted about threaded shaft 46 of pivot bolt 44 to the desired angle, as indicated in view window 54 in base member 12. When  
25 the desired angle is obtained wing nut 48 may be tightened to hold the particular angle

permanently. The length measurement indicia 52 can be virtually any system, such as inches, metric or the like. The bubble vial 56 can be used to level the base member 12 on any surface.

The multi-function level 10 can be constructed of virtually any material, wood, metal, rigid plastic or the like. The movable protractor arm 16 and base member 12 can be of solid or laminated construction, and are preferably formed of wood or rigid plastic. Changes in size, shape or in the absolute or relative dimensions of the parts, materials and the like will thus be apparent to those skilled in the art.

Therefore, the foregoing is considered as illustrative only of the principles of the invention. Further, various modifications may be made of the invention without departing from the scope thereof and it is desired, therefore, that only such limitations shall be placed thereon as are imposed by the prior art and which are set forth in the appended claims.

CLAIMS

## WHAT IS CLAIMED IS:

1. A multi-function level comprising:
  - a base member having a curved end,
  - 5 a movable protractor arm having a blade and a circular end,  
means for pivot locking said circular end of said movable protractor arm to said  
curved end of said base member,  
means on said circular end of said movable protractor arm for indicating angular  
measurement,
  - .0 means on said blade of said movable protractor arm for indicating length  
measurement,  
means in said curved end of said base member for viewing said angular measurement  
means on said circular end of said movable protractor arm, and  
means in said base member for leveling said base member.
- 1.5 2. A multi-function level as recited in Claim 1, wherein said base member includes:
  - a first elongate body having a longitudinal recess with an arced end portion on one  
side, matching in size to said blade and circular end of said movable protractor  
arm,
  - a second elongate body, and
  - !0 a retainer bolt and nut to hold said first elongate body to said second elongate body,  
remote from said circular end of said movable protractor arm being in said  
arced portion of said longitudinal recess.
3. The multi-function level as recited in Claim 1, wherein said pivot locking means  
includes a pivot bolt having a threaded shaft extending centrally through said curved  
!5 end of said base member and said circular end of said movable protractor arm, and a

wing nut threaded onto said threaded shaft of said pivot bolt, so that when said wing nut is tightened said circular end of said movable protractor arm will be retained in a stationary manner.

4. The multi-function level as recited in Claim 1, wherein said angular measurement  
5 indicating means includes angle degree indicia on said circular end of said movable protractor arm.
5. The multi-function level as recited in Claim 1, wherein said length measurement indicating means includes length measurement indicia on said blade of said movable protractor arm.
- 10 6. The multi-function level as recited in Claim 1, wherein said angular measurement viewing means includes at least one view window in said curved end of said base member.
7. The multi-function level as recited in Claim 1, wherein said leveling means includes a bubble vial longitudinally mounted within said base member.



**Fig. 1**

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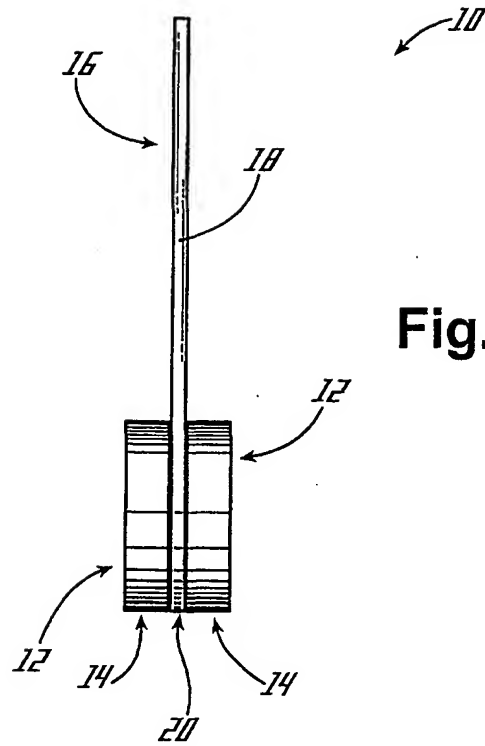


Fig. 2

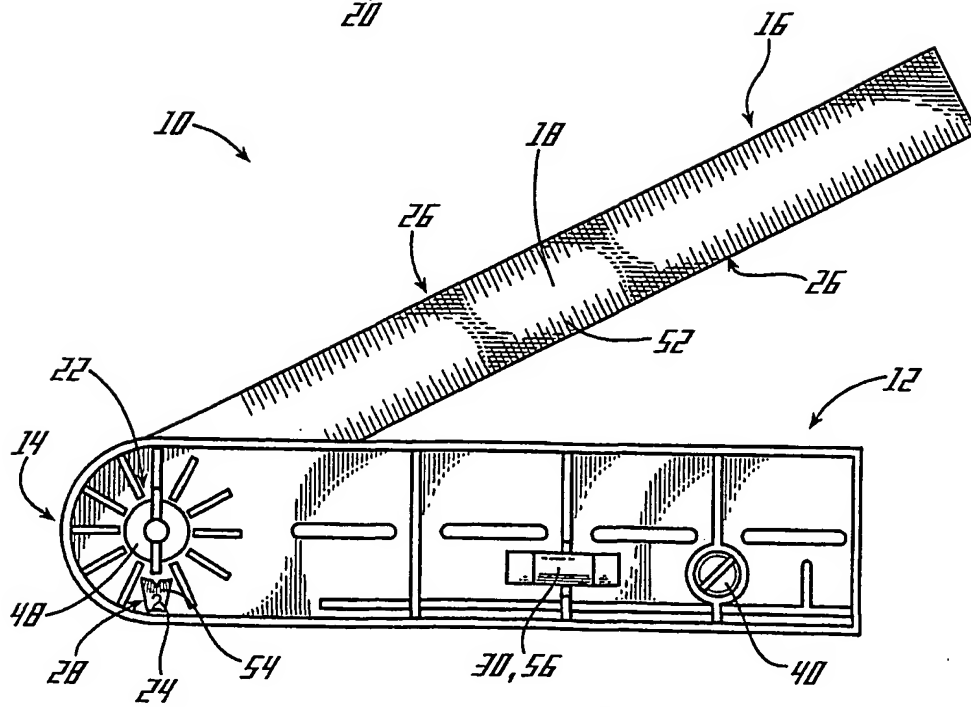


Fig. 3

